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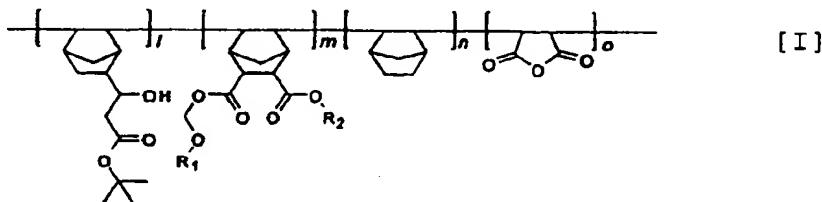
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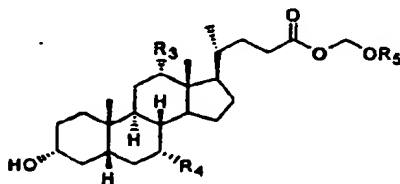
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(54) Chemically amplified positive photoresist composition

(57) Disclosed is a chemical amplification positive amplification which can be formed into resist patterns much improved in transparency, photosensitivity and resolution and is suitable to KrF and ArF excimer lasers, enabling a submicrolithography process to be as exquisite as 0.2 μm or less. This composition is based on a copolymer of the formula I, ranging, in polystyrene-reduced weight average molecular weight, from 3,000 to 50,000 with a molecular weight distribution (M_w/M_n) of 1.0 to 2.0, and a low molecular weight compound of the formula VI:



[I]



[VI]

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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 7323

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	T. I. WALLOW ET AL.: "Evaluation of Cycloolefinic-Maleic Anhydride Alternating Copolymers as Single-Layer Photoresists for 193 nm Photolithography" PROC. SPIE - INT. SOC. OPT. ENG., vol. 2724, March 1996 (1996-03), pages 355-364, XP002053109 * page 356, line 14-28; figure 1 * Chapter 2.2 "Dissolution inhibition" * page 357 - page 358 *	1-5	G03F7/004 G03F7/039
X	EP 0 789 278 A (JAPAN SYNTHETIC RUBBER CO., LTD.) 13 August 1997 (1997-08-13) see synthesis example 7 * page 6, line 5,6; claims 1,2 * * page 18, line 5,6 *	1-5	
X	EP 0 794 458 A (LUCENT TECHNOLOGIES INC.) 10 September 1997 (1997-09-10) * page 9, line 34-39; claims 1,7; examples 1,5,8,9 *	1-5	
X	WO 97 33198 A (THE B. F. GOODRICH COMPANY) 12 September 1997 (1997-09-12) * page 48, line 11-16; claims 1,2,11,15,40; examples 24,25,50,57,58 *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G03F
X,P	EP 0 880 074 A (LUCENT TECHNOLOGIES INC.) 25 November 1998 (1998-11-25) * page 6, line 10-17; figure 4; examples 1,3,4 *	1-5	
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 14 March 2000	Examiner Thiele, N
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 82 (P04001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 7323

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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14-03-2000

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82



WPI

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Photoresist monomer for photoresist composition used in semiconductor device manufacture by optical lithography, comprise a norbornene dicarboxylic anhydride-type compound

- AB - JP2000080124 NOVELTY - A photoresist monomer comprises a norbornene dicarboxylic anhydride-type compound.
- DETAILED DESCRIPTION - A photoresist monomer of formula (I) comprises a norbornene dicarboxylic anhydride-type compound.
- $m = 1$ or 2 .
- INDEPENDENT CLAIMS are also included for the following:
- (i) the manufacture of a photoresist copolymer, where photoresist monomers of formula (I) and formula (II) and maleic anhydride and/or maleimide derivative are dissolved in an organic solvent (A) and polymerization initiator is added to the resultant solution;
- (ii) a photoresist composition comprising a photoresist copolymer as above, a photooxidant generator and an organic solvent (B); and
- (iii) formation of a photoresist pattern by coating a photoresist composition as above on a semiconductor substrate to form a photoresist film and exposing and developing the film to form a pattern.
- R asterisk = acid sensitive protective group, preferably t-butyl, 2-tetrahydrofuran, 2-tetrahydropyran, ethoxy ethyl or t-butoxy ethyl; and
- $l = 1$ or 2 .
- USE - For semiconductor devices (claimed). The photoresist is used to manufacture highly integrated semiconductor devices by optical photolithography.
- ADVANTAGE - The photoresist monomer is etching resistant, heat resistant, optically sensitive and adheres strongly to the substrate. The photoresist copolymer can be exposed with ultrashort wavelength of 250 nm or less. The photoresist can be developed with existing alkali developer.
- (Dwg. 0/0)
- PN - JP2000080124 A 20000321 DW200053 C08F32/00 013pp
- KR2000015248 A 20000315 DW200104 G03F7/039 000pp
- KR2000015410 A 20000315 DW200104 G03F7/039 000pp
- PR - KR19980035291 19980828; KR19980035029 19980827
- PA - (HYUN-N) HYUNDAI ELECTRONICS IND CO LTD
- IN - NOH C H; CHUNG J C
- MC - A04-D04A1 A04-F05 A08-M08 A08-S02 A10-B04 A10-E05 A10-E10 A11-B05 A11-B05D A12-E07C A12-L02B2 G06-D06 G06-E04 G06-F03C G06-F03D G06-G17 G06-G18 L04-C05
- U11-A06A
- DC - A17 A89 G06 L03 P84 U11
- IC - C08F32/00 ; G03F7/039
- AN - 2000-567292 [53]

===== PAJ =====

- TI - PHOTORESIST MONOMER, PHOTORESIST COPOLYMER AND PREPARATION THEREOF, PHOTORESIST COMPOSITION, PHOTORESIST PATTERN FORMATION METHOD, AND SEMICONDUCTOR DEVICE
- AB - PROBLEM TO BE SOLVED: To obtain a photoresist monomer having etching resistance, heat resistance, capability to adhere to substrates, photosensitivity, and solubility in a normal alkali developing soln. by using a compd. having a norbornene or bicyclooctoene structure.
- SOLUTION: A compd. of formula I (wherein m is 1 or 2) is used in the form of copolymer contg. the compd. of formula I and a compd. of formula I (wherein R^* is an acid-sensitive protective group; and l is 1 or 2). Normally, t-butyl, 2-tetrahydrofuran, 2-tetrahydropyran, ethoxyethyl, and t-butoxyethyl groups are listed as the acid-sensitive protective group R^* . The copolymer is obtd. by the polymn. using a polymn. initiator or a metal catalyst. In the case of polymn. using a polymn. initiator, further addition of a comonomer (e.g. maleic anhydride or a maleimide deriv.) capable of accelerating the polymn. is pref. The mol. wt. of the copolymer is pref. 3,000-100,000.
- PN - JP2000080124 A 20000321
- PD - 2000-03-21
- ABD - 20000922
- ABV - 200006
- AP - JP19990241743 19990827
- PA - HYUNDAI ELECTRONICS IND CO LTD
- IN - ROH CHI HYEONG; JUNG JAE CHANG
- I - C08F32/00 ; G03F7/039